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(54) Electric push button switch

(57) A push button switch comprises contacts 12 and a bridging member 16 carried by a resilient upstanding portion 15 on an elastomer mat 14. Further contacts 26 are also provided and are bridged by a further bridging member 32 (or 28, Figure 1 or 16a, Figure 2, not shown). The contacts may be electrical circuit portions formed on two printed circuit boards 10, 24 or may be circuit portions on opposed sides of a single board (10a, Figure 3) which is moved on depression of the pushbutton 18. A set of break contacts 30 may also be provided.

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ERRATUM

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Page No. 1 Line No. 110 for contat read contact.

THE PATENT OFFICE  
25 March 1985

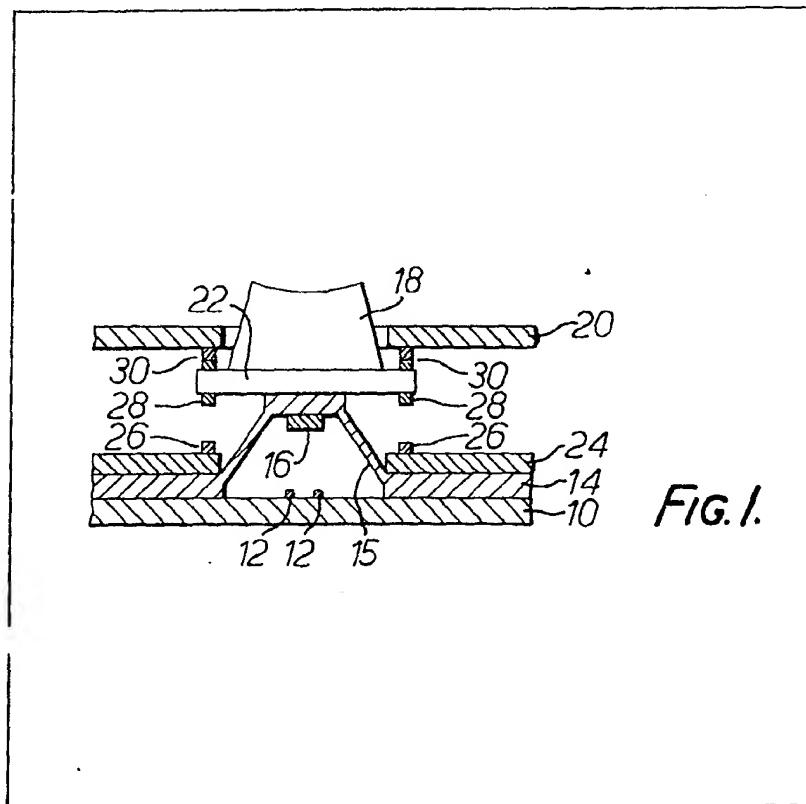
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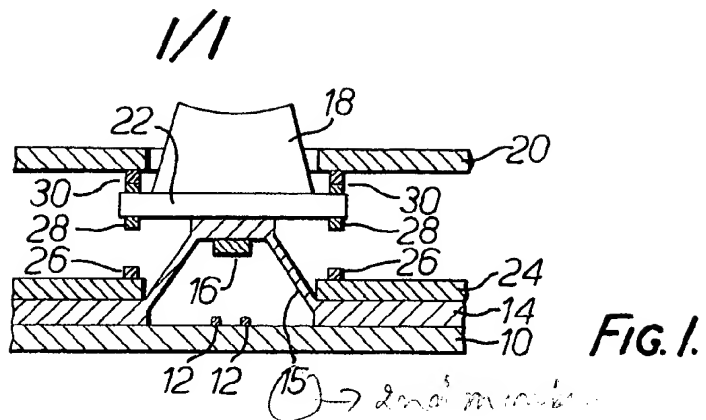
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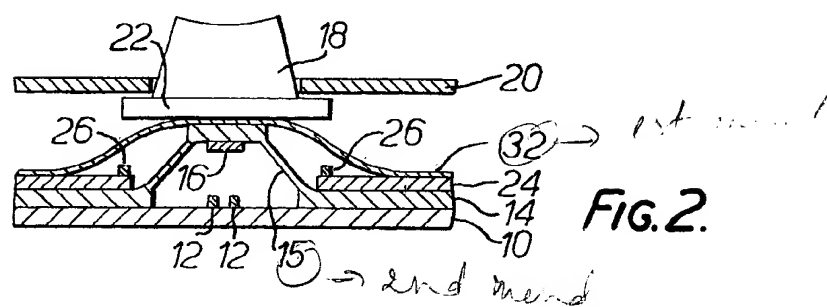
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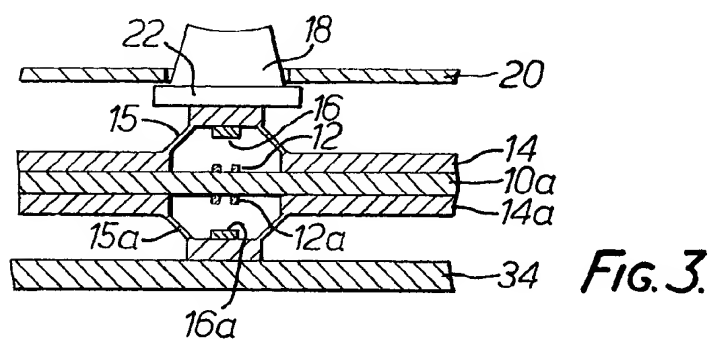
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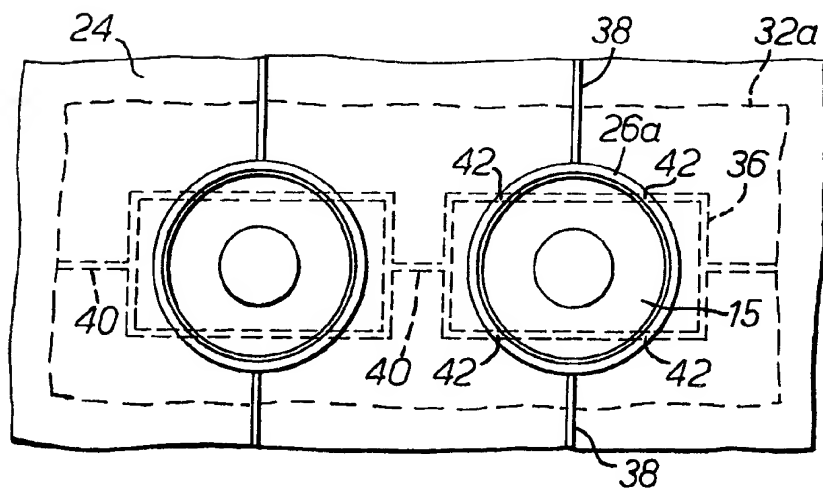
**FIG. 1.**



**FIG. 2.**



**FIG. 3.**



**FIG. 4.**

## SPECIFICATION

**Improvements in or relating to push button arrangements for electrical apparatus**

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This invention relates to push button arrangements for electrical apparatus and more particularly but not exclusively to push buttons for telephones.

With the advent of new types of telephones which incorporate more facilities, such as access to data from a computer, store a plurality of different numbers and have repertory calling ability, it is necessary for at least some of the push buttons to have additional functions to merely signalling one digit when depressed, and it is an object of the present invention to provide such additional functions whilst maintaining the push button arrangement relatively simple and low in cost.

According to the present invention a push button arrangement for electrical apparatus comprises a first electrical circuit having two isolated contact portions, an insulating member located over the circuit and having an upstanding deformable portion arranged adjacent to and spaced from the two contact portions of the circuit, the upstanding portion including a conductive member, a push button abutting the upstanding portion and adapted to deform the upstanding portion such that the conductive member bridges the two contact portions and completes the first electrical circuit when the push button is fully depressed, the upstanding portion also acting as a return spring for the push button, a second electrical circuit insulated from said first electrical circuit having further contact portions, a further conductive member located adjacent to and spaced from the further contact portions, the further conductive member also connecting with the further contact portions when the push button is fully depressed to complete the second electrical circuit.

The first electrical circuit and the second electrical circuit and their associated contacts are preferably formed on first and second circuit boards.

The insulating member is preferably located directly on the first circuit board.

The second circuit board may be located on the insulating member, suitable openings being provided in the second circuit board so that the push button can contact the upstanding deformable portions of the resilient member.

The further conductive member may be formed on the underside of the push button and the further contact portions arranged on the second circuit board such that the further contact portions are bridged when the push button is fully depressed.

Alternatively, the further conductive member may comprise a deformable conductive sheet which is normally spaced from the further contact portions but is movable to bridge the further contact portions when the push button is fully depressed.

The further conductive member may comprise a deformable insulating sheet carrying at least one conductive member which is normally spaced from the further contact portions but is movable to connect with the further contact portions when the push button is fully depressed the second electrical

circuit being completed through the conductive members carried on the deformable insulating sheet.

The first and second electrical circuits may be formed on opposite sides of a single circuit board and an insulating member located over each circuit, each insulating member having an upstanding deformable portion carrying a conductive member adapted to bridge the contact portions on each circuit, a push button contacting one of the upstanding portions and a fixed plate contacting the other upstanding portion, the circuit board being movable whereby when the push button is fully depressed both the upstanding portions deform and the circuit board moves such that both conductive members bridge the two sets of contact portions.

Embodiments of the invention will now be described by way of example only with reference to the accompanying drawings in which

*Figure 1* is a cross-sectional view of a push button arrangement according to the present invention, *Figures 2* and *3* are cross-sectional views of two different push button arrangements according to the present invention and

*Figure 4* is a plan view of a modification to the push button arrangement shown in *Figure 2*.

The arrangement shown in *Figure 1* consists of a printed circuit board 10 carrying an electrical circuit (not shown) with two contacts 12 which are adapted to be bridged to complete the circuit. On the printed circuit board 10 is mounted on elastomer mat 14 which has a raised conical portion 15 located above the contact 12, the underside of the upper part of this conical portion having a conductive contact portion 16. The mat 14 may have a plurality of raised conical portions 15, such as, for example, twelve arranged in a four by three formation for a typical push button telephone with twelve push buttons. The sides of the conical portion 15 are relatively thin and collapse when pressure is applied to the top of the conical portion, but recovers its original shape when the pressure is removed. Thus a push button 18 is mounted on the top of the conical portion such that when the button is fully depressed, the conical portion collapses and the contact portion 16 bridges the contacts 12 completing the electrical circuit. The conical portion acts as a return spring for the button 18. A top plate 20 engages a flange 22 formed on the button 18 to retain the button in position.

A second printed circuit board 24 is mounted on the mat 14 and this also carries an electrical circuit (not shown) and two contacts 26 which are adapted to be bridged to complete the circuit. The second printed circuit board is provided with suitable holes to permit the conical portions 15 of the mat 14 to project therethrough. On the flange 22 are located contact portions 28 which are suitably connected so that when the push button is fully depressed the contacts 26 are bridged.

An additional feature which can also be incorporated into the arrangement is a set of break contacts 30 for an electrical circuit mounted on the underside of the top plate 20, this circuit being bridged when the button is in its normal position and broken when the button 18 is pressed.

In Figures 2 and 3 similar reference numbers have been allocated to similar parts as shown in Figures 1, and in Figures 2 the contact portions 28 have been removed from the flange 22 of the push button 18 and fitted over the printed circuit board 24 and the conical portion 15 is a conductive flexible sheet 32 which may be made of an elastomer. When the button 18 is fully depressed and the conical portion 15 has collapsed the sheet 32 bridges the contacts 26 on the second printed circuit board 24. It is normally maintained clear of the contacts 26 by the conical portion 15.

There is illustrated in Figure 3 a printed circuit board 10a which carries an electrical circuit and contacts 12 and 12a on opposite sides. Two identical elastomer mats 14 and 14a are used, one 14 as shown in Figures 1 and 2 which supports the push button 18, and one 14a arranged inverted on the opposite side of the printed circuit board 10a with the raised conical portion 15a contacting a fixed back plate 34. In this case the printed circuit board 10a is movable so that when the push button is fully depressed, the contacts 12 are bridged by the contact portion 16 and the conical portion 15a also collapses and the contacts 12a are bridged by the contact portion 16a.

Figure 4 is a plan view of a modification to the arrangement shown in Figure 2 showing only a part of the second printed circuit board 24 (in solid lines), parts of a partially conductive flexible mat 32a (shown in broken lines) and two conical portions 15 (in solid lines). The cross-sectional view of this arrangement is exactly the same as Figure 2, but the contacts 26 are replaced by a circular conductive member 26a surrounding the hole in the second printed circuit board 24, and this is connected to a conductive strip 38 which extends to other circular conductive members located in the same vertical row as seen in Figure 4. On the underside of the flexible mat 32a is arranged a flexible conductive strip 36 arranged in a rectangular formation over the circular conductive member 26a, and this is connected to a flexible conductive strip 40 which extends to other flexible strips 36 located in the same horizontal row as seen in Figure 4. When the push button is depressed the mat 32a in the area immediately surrounding the conical member 15 contacts the printed circuit board 24 and electrical contact is made at the four points 42. The conductive strip 38 is thus connected to the flexible conductive strip 40 to complete an electrical circuit formed on the second printed circuit board 24 and the flexible mat 32a. The flexible conductive strips 36 and 40 may be gold deposited on the surface of the mat 32a.

Various other arrangements of conductive strips 36, 38, 40 and 26a may be used.

#### CLAIMS

1. A push button arrangement for electrical apparatus comprising a first electrical circuit having two isolated contact portions, an insulating member located over the circuit and having an upstanding deformable portion arranged adjacent to and spaced from the two contact portions of the circuit, the

upstanding portion including a conductive member, a push button abutting the upstanding portion and adapted to deform the upstanding portion such that the conductive member bridges the two contact portions and completes the first electrical circuit when the push button is fully depressed, the upstanding portion also acting as a return spring for the push button, a second electrical circuit insulated from said first electrical circuit having further contact portions, a further conductive member located adjacent to and spaced from the further contact portions, the further conductive member also connecting with the further contact portions when the push button is fully depressed to complete the second electrical circuit.

2. A push button arrangement as claimed in claim 1 in which the first electrical circuit and the second electrical circuit and their associated contacts are formed on first and second circuit boards.

3. A push button arrangement as claimed in claim 2 in which the insulating member is located directly on the first circuit board.

4. A push button arrangement as claimed in claim 2 or claim 3 in which the second circuit board, is located on the insulating member, suitable openings being provided in the second circuit board so that the push button can contact the upstanding deformable portions of the resilient member.

5. A push button arrangement as claimed in any of claims 2 to 4 in which the further conductive member is formed on the underside of the push button and the further contact portions arranged on the second circuit board such that the further contact portions are bridged when the push button is fully depressed.

6. A push button arrangement as claimed in any of claims 2 to 4 in which the further conductive member comprises a deformable conductive sheet which is normally spaced from the further contact portions but is movable to bridge the further contact portions when the push button is fully depressed.

7. A push button arrangement as claimed in any of claims 2 to 4 in which the further conductive member comprises a deformable insulating sheet carrying at least one conductive member which is normally spaced from the further contact portions but is movable to connect with the further contact portions when the push button is fully depressed the second electrical circuit being completed through the conductive members carried on the deformable insulating sheet.

8. A push button arrangement as claimed in claim 1 in which the first and second electrical circuits are formed on opposite sides of a single circuit board and an insulating member located over each circuit, each insulating member having an upstanding deformable portion carrying a conductive member adapted to bridge the contact portions on each circuit, a push button contacting one of the upstanding portions and a fixed plate contacting the other upstanding portion, the circuit board being movable whereby when the push button is fully depressed both the upstanding portions deform and the circuit board moves such that the conductive members bridge the two sets of contact portions.

9. A push button arrangement for electrical apparatus constructed and adapted to operate substantially as hereinbefore described with reference to Figures 1, 2, 3 or 4 of the accompanying drawings.

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